

SEQUENCE LISTING

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LIU, CHANG-JUN
DEAVOURS, BETTINA

<120> METHODS AND COMPOSITIONS FOR PRODUCTION OF FLAVONOID
AND ISOFLAVONOID NUTRACEUTICALS

<130> NBLE:007US

<140> UNKNOWN

<141> 2003-09-10

<150> 60/409,447

<151> 2002-09-10

<160> 14

<170> PatentIn Ver. 2.1

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Pro Asn Pro Pro Ser Pro Lys Pro Arg Leu Pro Phe Ile Gly His Leu
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His Leu Leu Lys Asp Lys Leu Leu His Tyr Ala Leu Ile Asp Leu Ser
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Lys Lys His Gly Pro Leu Phe Ser Leu Tyr Phe Gly Ser Met Pro Thr
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Val Val Ala Ser Thr Pro Glu Leu Phe Lys Leu Phe Leu Gln Thr His
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Glu Ala Thr Ser Phe Asn Thr Arg Phe Gln Thr Ser Ala Ile Arg Arg
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Leu Thr Tyr Asp Ser Ser Val Ala Met Val Pro Phe Gly Pro Tyr Trp
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Lys Phe Val Arg Lys Leu Ile Met Asn Asp Leu Pro Asn Ala Thr Thr
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Val Asn Lys Leu Arg Pro Leu Arg Thr Gln Gln Thr Arg Lys Phe Leu
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Arg Val Met Ala Gln Gly Ala Glu Ala Gln Lys Pro Leu Asp Leu Thr
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Gly Glu Ala Glu Glu Ile Arg Asp Ile Ala Arg Glu Val Leu Lys Ile
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Phe Gly Glu Tyr Ser Leu Thr Asp Phe Ile Trp Pro Leu Lys His Leu
210 215 220

Lys Val Gly Lys Tyr Glu Lys Arg Ile Asp Asp Ile Leu Asn Lys Phe
225 230 235 240

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Arg Arg Lys Asn Gly Glu Val Val Glu Gly Glu Val Ser Gly Val Phe
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Thr Ala Ile Thr Val Glu Asn Leu Glu Tyr Pro Ala Val Val Thr Ser
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Pro Val Thr Gly Lys Ser Tyr Phe Leu Gly Gly Ala Gly Glu Arg Gly
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Leu Thr Ile Glu Gly Asn Phe Ile Lys Phe Thr Ala Ile Gly Val Tyr
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 Val Leu Arg Ser Val Ala Ile
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 Met Val Val Val Glu Val Pro Arg Leu Gly Lys Glu Ala Ala Val Lys
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 Ala Ile Lys Glu Trp Gly Gln Pro Lys Ser Lys Ile Thr His Leu Ile
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 Thr Lys Leu Leu Gly Leu Arg Pro Tyr Val Lys Arg Tyr Met Met Tyr
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Pro	Asp	Phe	Tyr	Phe	Lys	Ile	Thr	Asn	Ser	Glu	His	Lys	Val	Glu	Leu	
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Lys	Glu	Lys	Phe	Gln	Arg	Met	Cys	Asp	Lys	Ser	Met	Ile	Lys	Arg	Arg	
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Glu	Val	Pro	Arg	Leu	Gly	Lys	Glu	Ala	Ala	Val	Lys	Ala	Ile	Lys	Glu	
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Trp	Gly	Gln	Pro	Lys	Ser	Lys	Ile	Thr	His	Leu	Ile	Phe	Cys	Thr	Thr	
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agt	ggc	gta	gac	atg	cct	ggc	gcc	gat	tac	caa	ctc	aca	aaa	ctc	tta	549
Ser	Gly	Val	Asp	Met	Pro	Gly	Ala	Asp	Tyr	Gln	Leu	Thr	Lys	Leu	Leu	
		135					140					145				
ggc	ctt	cgt	cca	tat	gtg	aaa	agg	tat	atg	atg	tac	caa	caa	ggg	tgc	597
Gly	Leu	Arg	Pro	Tyr	Val	Lys	Arg	Tyr	Met	Met	Tyr	Gln	Gln	Gly	Cys	
	150					155					160					
ttt	gca	ggc	ggg	acg	gtc	ctt	cgt	ttg	gcc	aag	gac	ttg	gct	gag	aac	645
Phe	Ala	Gly	Gly	Thr	Val	Leu	Arg	Leu	Ala	Lys	Asp	Leu	Ala	Glu	Asn	
165					170					175					180	
aat	aaa	ggc	gct	cgt	gtg	ttg	gtt	gtt	tgt	tct	gaa	gtt	act	gcg	gtg	693
Asn	Lys	Gly	Ala	Arg	Val	Leu	Val	Val	Cys	Ser	Glu	Val	Thr	Ala	Val	
				185					190					195		
aca	ttc	cgt	ggc	cct	agt	gat	act	cat	tta	gac	agt	ctt	gtt	gga	caa	741
Thr	Phe	Arg	Gly	Pro	Ser	Asp	Thr	His	Leu	Asp	Ser	Leu	Val	Gly	Gln	
			200					205					210			
gca	ctc	ttt	gga	gat	ggc	gct	gct	gca	ctc	att	gtt	ggc	tct	gac	cca	789
Ala	Leu	Phe	Gly	Asp	Gly	Ala	Ala	Ala	Leu	Ile	Val	Gly	Ser	Asp	Pro	
	215					220						225				
ata	cca	gaa	att	gag	aaa	cct	ata	ttt	gag	atg	gtt	tgg	act	gca	caa	837
Ile	Pro	Glu	Ile	Glu	Lys	Pro	Ile	Phe	Glu	Met	Val	Trp	Thr	Ala	Gln	
	230					235					240					
aca	att	gct	cca	gac	agt	gaa	gga	gcc	att	gat	ggc	cac	ctt	gtc	gaa	885
Thr	Ile	Ala	Pro	Asp	Ser	Glu	Gly	Ala	Ile	Asp	Gly	His	Leu	Val	Glu	
	245				250					255					260	
gct	ggc	cta	aca	ttt	cac	ctt	ctt	aaa	gat	gtt	cct	ggg	att	gtt	tca	933
Ala	Gly	Leu	Thr	Phe	His	Leu	Leu	Lys	Asp	Val	Pro	Gly	Ile	Val	Ser	
				265					270					275		
aag	aac	att	gat	aaa	gca	ttg	att	gag	gct	ttc	caa	cca	tta	aac	atc	981
Lys	Asn	Ile	Asp	Lys	Ala	Leu	Ile	Glu	Ala	Phe	Gln	Pro	Leu	Asn	Ile	
			280					285					290			
tct	gat	tac	aat	tca	atc	ttc	tgg	att	gct	cac	cca	ggc	gga	ccc	gca	1029
Ser	Asp	Tyr	Asn	Ser	Ile	Phe	Trp	Ile	Ala	His	Pro	Gly	Gly	Pro	Ala	

295	300	305	
att cta gac caa gtt gaa gaa aag tta ggc tta aaa cct gaa aag atg			1077
Ile Leu Asp Gln Val Glu Glu Lys Leu Gly Leu Lys Pro Glu Lys Met			
310	315	320	
aag gcc act agg gaa gta ctt agt gaa tat ggt aac atg tca agt gca			1125
Lys Ala Thr Arg Glu Val Leu Ser Glu Tyr Gly Asn Met Ser Ser Ala			
325	330	335	340
tgt gta ttg ttc atc tta gat gag atg aga aag aaa tcg gca caa gcg			1173
Cys Val Leu Phe Ile Leu Asp Glu Met Arg Lys Lys Ser Ala Gln Ala			
	345	350	355
gga ctt aaa acc aca gga gaa ggc ctt gac tgg ggt gtg ttg ttt ggc			1221
Gly Leu Lys Thr Thr Gly Glu Gly Leu Asp Trp Gly Val Leu Phe Gly			
	360	365	370
ttc gga cct gga ctt acc att gaa acc gtt gtt ctc cat agc gtg gct			1269
Phe Gly Pro Gly Leu Thr Ile Glu Thr Val Val Leu His Ser Val Ala			
	375	380	385
ata tga aatgattgat tgttttattt tattgtatta cttttaaaact tgcttgaaat			1325
Ile			
390			
tccatgtaag aataaataca gagttcatgt accatggatg ttaaaacgaa tataccattt			1385
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 <212> PRT
 <213> Medicago sativa

<400> 9

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Ala Thr Ile Met Ala Ile Gly Thr Ala Asn Pro Ser Asn Cys Val Glu			
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Gln Ser Thr Tyr Pro Asp Phe Tyr Phe Lys Ile Thr Asn Ser Glu His			
	35	40	45
Lys Val Glu Leu Lys Glu Lys Phe Gln Arg Met Cys Asp Lys Ser Met			
	50	55	60
Ile Lys Arg Arg Tyr Met Tyr Leu Thr Glu Glu Ile Leu Lys Glu Asn			
	65	70	75
Pro Ser Val Cys Glu Tyr Met Ala Pro Ser Leu Asp Ala Arg Gln Asp			
	85	90	95
Met Val Val Val Glu Val Pro Arg Leu Gly Lys Glu Ala Ala Val Lys			
	100	105	110
Ala Ile Lys Glu Trp Gly Gln Pro Lys Ser Lys Ile Thr His Leu Ile			
	115	120	125
Phe Cys Thr Thr Ser Gly Val Asp Met Pro Gly Ala Asp Tyr Gln Leu			
	130	135	140
Thr Lys Leu Leu Gly Leu Arg Pro Tyr Val Lys Arg Tyr Met Met Tyr			
	145	150	155
			160

Gln Gln Gly Cys Phe Ala Gly Gly Thr Val Leu Arg Leu Ala Lys Asp
 165 170 175
 Leu Ala Glu Asn Asn Lys Gly Ala Arg Val Leu Val Val Cys Ser Glu
 180 185 190
 Val Thr Ala Val Thr Phe Arg Gly Pro Ser Asp Thr His Leu Asp Ser
 195 200 205
 Leu Val Gly Gln Ala Leu Phe Gly Asp Gly Ala Ala Leu Ile Val
 210 215 220
 Gly Ser Asp Pro Ile Pro Glu Ile Glu Lys Pro Ile Phe Glu Met Val
 225 230 235 240
 Trp Thr Ala Gln Thr Ile Ala Pro Asp Ser Glu Gly Ala Ile Asp Gly
 245 250 255
 His Leu Val Glu Ala Gly Leu Thr Phe His Leu Leu Lys Asp Val Pro
 260 265 270
 Gly Ile Val Ser Lys Asn Ile Asp Lys Ala Leu Ile Glu Ala Phe Gln
 275 280 285
 Pro Leu Asn Ile Ser Asp Tyr Asn Ser Ile Phe Trp Ile Ala His Pro
 290 295 300
 Gly Gly Pro Ala Ile Leu Asp Gln Val Glu Glu Lys Leu Gly Leu Lys
 305 310 315 320
 Pro Glu Lys Met Lys Ala Thr Arg Glu Val Leu Ser Glu Tyr Gly Asn
 325 330 335
 Met Ser Ser Ala Cys Val Leu Phe Ile Leu Asp Glu Met Arg Lys Lys
 340 345 350
 Ser Ala Gln Ala Gly Leu Lys Thr Thr Gly Glu Gly Leu Asp Trp Gly
 355 360 365
 Val Leu Phe Gly Phe Gly Pro Gly Leu Thr Ile Glu Thr Val Val Leu
 370 375 380
 His Ser Val Ala Ile
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<211> 1242

<212> DNA

<213> Arabidopsis thaliana

<400> 10

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 gagatctgcc gtcagatcgt cgaggcttgt gagaattggg gtatcttcca agtgggttgat 180
 cacggcgctg atactaactt ggtggcggat atgactcgcc tcgctcgtga cttctttgct 240
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 gtctctagtc acctccagggt aaaagccaca ccacaatctt ctaggttaaa tacgtaatta 360
 tgttttaatc ttgccgttaa agacataata attatactat aaatacaggg agaggctgtg 420
 caagattgga gagagattgt aacgtatttc tcgtaccggtg tgagaaacag agactactca 480
 cggtggccaa ataagcctga aggatgggtg aaagtgcagg aggagtatag tgagaggctt 540
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 cttgatttgt cttgatgaag tttttgagca atgggagggt caagaatgct gatcatcagg 960
 ccgtggtgaa ctctaactcg agcagattat ccatagccac gttccagaac cccgcgccgg 1020
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 agaagctggc taaagaggag cgtgaccaca aagaagttgc caagcctgtc gaccaaattct 1200
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 <212> PRT
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<400> 11
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 Arg Leu Asp Leu Val Val Ser Asp Ala Arg Ile Pro Val Val Asp Leu
 35 40 45
 Ala Ser Pro Asp Arg Ala Ala Val Val Ser Ala Val Gly Asp Ala Cys
 50 55 60
 Arg Thr His Gly Phe Phe Gln Val Val Asn His Gly Ile Asp Ala Ala
 65 70 75 80
 Leu Ile Ala Ser Val Met Glu Val Gly Arg Glu Phe Phe Arg Leu Pro
 85 90 95
 Ala Glu Glu Lys Ala Lys Leu Tyr Ser Asp Asp Pro Ala Lys Lys Ile
 100 105 110
 Arg Leu Ser Thr Ser Phe Asn Val Arg Lys Glu Thr Val His Asn Trp
 115 120 125
 Arg Asp Tyr Leu Arg Leu His Cys Tyr Pro Leu His Gln Phe Val Pro
 130 135 140
 Asp Trp Pro Ser Asn Pro Pro Ser Phe Lys Glu Ile Ile Gly Thr Tyr
 145 150 155 160
 Cys Thr Glu Val Arg Glu Leu Gly Phe Arg Leu Tyr Glu Ala Ile Ser
 165 170 175
 Glu Ser Leu Gly Leu Glu Gly Gly Tyr Met Arg Glu Thr Leu Gly Glu
 180 185 190
 Gln Glu Gln His Met Ala Val Asn Tyr Tyr Pro Gln Cys Pro Glu Pro
 195 200 205
 Glu Leu Thr Tyr Gly Leu Pro Ala His Thr Asp Pro Asn Ala Leu Thr
 210 215 220
 Ile Leu Leu Met Asp Asp Gln Val Ala Gly Leu Gln Val Leu Asn Asp
 225 230 235 240
 Gly Lys Trp Ile Ala Val Asn Pro Gln Pro Gly Ala Leu Val Ile Asn

ccc atc atc tcg ctt gcc ggg ata gac gaa gtc cat ggc cgg agg acc	96
Pro Ile Ile Ser Leu Ala Gly Ile Asp Glu Val His Gly Arg Arg Thr	
20 25 30	
gag att tgc cag aaa atc gtc gag gcc tgt gag gac tgg ggt att ttc	144
Glu Ile Cys Gln Lys Ile Val Glu Ala Cys Glu Asp Trp Gly Ile Phe	
35 40 45	
cag gtg gtc gat cat ggc gtc gat gcc agt cta atc tcc gac atg aca	192
Gln Val Val Asp His Gly Val Asp Ala Ser Leu Ile Ser Asp Met Thr	
50 55 60	
cgt ctt gcc cgt gac ttc ttc gcc atg cct ccc gag gaa aag ctt cgt	240
Arg Leu Ala Arg Asp Phe Phe Ala Met Pro Pro Glu Glu Lys Leu Arg	
65 70 75 80	
ttc gac atg tcc ggc ggc aag aag ggc ggt ttc att gtc tcc agc cat	288
Phe Asp Met Ser Gly Gly Lys Lys Gly Gly Phe Ile Val Ser Ser His	
85 90 95	
ctg caa gga gaa gca gtg caa gat tgg cgt gaa att gtg aca tat ttc	336
Leu Gln Gly Glu Ala Val Gln Asp Trp Arg Glu Ile Val Thr Tyr Phe	
100 105 110	
tca tac cca att agg acc aga gac tat tcg agg tgg ccg gac aag cca	384
Ser Tyr Pro Ile Arg Thr Arg Asp Tyr Ser Arg Trp Pro Asp Lys Pro	
115 120 125	
gaa ggg tgg aga aag gtg acg gag gag tac agt gac aaa ttg atg gga	432
Glu Gly Trp Arg Lys Val Thr Glu Glu Tyr Ser Asp Lys Leu Met Gly	
130 135 140	
ctg gca tgc aaa ctg ttg gaa gtg cta tcg gag gcg atg gga tta gag	480
Leu Ala Cys Lys Leu Leu Glu Val Leu Ser Glu Ala Met Gly Leu Glu	
145 150 155 160	
aag gaa gca ttg acc aag gct tgc gtg gat atg gac caa aag gtt gtg	528
Lys Glu Ala Leu Thr Lys Ala Cys Val Asp Met Asp Gln Lys Val Val	
165 170 175	
gtt aat tac tat cca aaa tgt cca cag cca gac ctc aca ttg ggg cta	576
Val Asn Tyr Tyr Pro Lys Cys Pro Gln Pro Asp Leu Thr Leu Gly Leu	
180 185 190	
aag cgc cac aca gat cct ggc acc atc act ctg ttg ttg cag gac cag	624
Lys Arg His Thr Asp Pro Gly Thr Ile Thr Leu Leu Leu Gln Asp Gln	
195 200 205	
gtg ggt ggg ctt cag gcc acc agg gat ggc ggc aag acc tgg atc act	672
Val Gly Gly Leu Gln Ala Thr Arg Asp Gly Gly Lys Thr Trp Ile Thr	
210 215 220	
gtt cag cct gtt gaa gga gct ttc gtc gtc aat ctt gga gac cat ggt	720
Val Gln Pro Val Glu Gly Ala Phe Val Val Asn Leu Gly Asp His Gly	
225 230 235 240	
cat ttt ctg agt aac ggg agg ttc aag aac gct gat cac caa gca gtg	768

225		230		235		240									
His	Phe	Leu	Ser	Asn	Gly	Arg	Phe	Lys	Asn	Ala	Asp	His	Gln	Ala	Val
				245					250					255	
Val	Asn	Ser	Asn	Tyr	Ser	Arg	Leu	Ser	Ile	Ala	Thr	Phe	Gln	Asn	
			260					265					270		